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Horizontal and Vertical (Buyer-Supplier) Spillovers from Foreign Direct Investment: Determinants of Malaysian Establishments' Total Factor Productivity

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Abstract

This study examines the issue of indirect technology transfer through both horizontal and vertical spillovers from foreign direct investment (FDI). Combining both input-output data for 2000 and a balanced micro-panel data set for the period 2000-2004, we estimate total factor productivity (TFP) of establishments as a function of the different extent of foreign presence and inter industry linkages; amongst other explanatory variables. All measures of forward linkages from FDI presence negatively affect TFP whereas the size of establishment positively affects TFP. However, alternative measures of horizontal and backward vertical spillovers from FDI reveal positive spillover effects exist only for wholly foreign-owned establishments affecting TFP positively. Government policies allowing for 100% foreign ownership in establishments that export greater than 80% of their output (so called "export-oriented industrialization") led to a proliferation of wholly foreign-owned establishments in the electrical and electronics sector in which production is relatively labor intensive leading to positive horizontal and vertical spillover effects in terms of backward linkages. Shared ownership (including local ownership), for instance, in the manufacture of chemical and refined petroleum products which is relatively capital intensive leads to positive backward vertical spillover and insignificant horizontal spillover when foreign ownership is weighted by capital. In cases of shared ownership, the spillover effects are detrimental or insignificant when foreign is weighted in terms of wages and output. Horizontal spillover effects are absent for domestic establishments although backward linkages are always positive and significant. The results suggest that factor proportions or technological intensity of production as well as different weights used to measure the extent of foreign involvement in industries influences spillover effects and not just the degree of foreign ownership *per se*.

Keywords: Foreign Direct Investment, Horizontal and Vertical Spillovers, Total Factor Productivity, International linkages
JEL classification codes: D24; D57; O19, O24

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1. Introduction

The World Investment Report 2001 examines the role of linkages and emphasizes the importance of linkages in increasing the productivity of local firms in the developing countries. Linkages can be powerful channels for diffusing knowledge and skills between firms' (UNCTAD, 2001: p. 129). More recently, many academic researchers seek to examine the impact of vertical spillovers on productivity of local firms given that the empirical evidence on horizontal foreign direct investment (FDI) spillovers has produced mixed results with no strong consensus on the magnitudes and causality of FDI spillovers. In other words, researchers attempt to differentiate between vertical (inter-industry) spillovers in terms of backward and forward linkages and horizontal (intra-industry) FDI spillovers through the channels of competition and demonstration effects as well as mobility of labor.

Vertical spillover from FDI is where foreign investors are linked to indigenous firms in the upstream and downstream industries. There is a possibility of domestic firms gaining technological benefits in the upstream and downstream industries in host countries (Kohpaiboon, 2009). Multinational corporations (MNCs) have the incentive to transfer knowledge through vertical spillovers because of the demand for high quality inputs, on time delivery and after-sales-service support (Javorcik, 2004). Backward linkages may be related to local firms providing intermediate goods to foreign firms and forward linkages relate to the production of MNC being used as intermediates by local firms (Barrios and Strobl, 2002). In this paper, we examine both horizontal and vertical spillover effects from FDI as determinants of total factor productivity (TFP) in the Malaysian manufacturing sector.

There is theoretical evidence that linkage is one of the channels of FDI spillovers (Smeets, 2008). Rodríguez-Clare (1996) states that the linkage effect of multinationals on the host country is more likely to be favorable when the goods that multinationals produce uses intermediate goods intensively. Therefore, there is a need to study vertical spillover of foreign and local establishments on local suppliers in the Malaysian manufacturing sector. Hence, this study attempts to carefully investigate the buyer-supplier linkages (vertical spillovers) by comparing the ownership structure of the Malaysian manufacturing sector. Ownership structure may be important in the context of formulating policies with respect to foreign equity ownership for MNCs in Malaysia (MIDA, 2008).

Using establishment-level panel data for the period of 2000-2004, the study examines intra-industry (horizontal) spillovers and inter-industry (vertical) spillovers from foreign direct investment by comparing total factor productivity of both foreign and local establishments. In other words, this study examines differences in total factor productivity (TFP) behavior between local establishments and foreign-owned establishments. In particular, this paper contributes to the existing literature by analyzing the impact of different proxies of foreign presence measured in terms of wages, fixed assets and output and also three subsamples of establishments with different extents of foreign ownership: wholly foreign-owned establishments (100% foreign ownership), foreign establishments with other than 100% foreign ownership (both shared and local ownership) and local establishments (less than 10% foreign ownership). This study also analyzes the impact of vertical spillover on TFP and its policy implications.

The paper is structured as follows. Section 2 briefly discusses previous studies on vertical linkages and their determinants specifically in terms of the Malaysian manufacturing sector. Section 3 explains the data and methodology used for the analysis, followed by the presentation of the empirical results in Section 4. The conclusion appears in Section 5.

2. Literature Review

There are several studies that empirically investigate vertical spillovers from MNCs which transmit technology indirectly to local suppliers and customers. Javorcik (2004) analyzes productivity of about 4000 Lithuanian firms with the presence of multinationals in downstream sectors (customers - forward) and upstream industries (potential suppliers of intermediate inputs - backward). Javorcik (2004) finds evidence of positive productivity spillovers through backward linkages but not forward linkages as well as no evidence of intrasectoral spillovers. Javorcik and Spatareanu (2008) also finds evidence of positive productivity spillovers through backward linkages for projects with shared domestic and foreign ownership but not for fully owned foreign subsidiaries for the period 1998-2003. Their result for the fully owned foreign subsidiaries in the upstream sector is negative and insignificant. When Javorcik and Spatareanu (2008) consider intra-industry effects, the wholly owned foreign affiliates have a larger negative effect on the productivity growth of Romanian firms in the same sector than the partially owned FDI projects. Blalock and Gertler (2008) also find evidence of positive productivity spillovers through backward linkages in the Indonesian manufacturing sector and conclude that vertical supply chains are a conduit for technology transfer from FDI in emerging markets.

Spillovers from FDI may act as a substitute or complement to the productivity of the host country. A study by Kugler (2006) based on Colombian Manufacturing Census since 1974 until 1998 finds that there is no diffusion of externalities within sectors but there is evidence of inter-industry spillovers from FDI. In other words, the host country firms within the MNC's sector experience limited productivity gains from FDI but host country producers in other sectors may benefit from FDI. The study by Kugler (2006) concludes that FDI act as a substitute for within-sector (intra-industry) domestic investment but a complement for between sectors (inter-industry) domestic investment.

The effects of intra- and inter-industry buyer-supplier linkages have also been studied by Driffield et al. (2002, 2004). Driffield et al. (2002) finds evidence that domestic firms benefit from purchasing from multinationals in the same sector (intra-industry) and in other sectors (inter-industry). The domestic firms might be benefiting in terms of input attributes such as higher quality components, better technology and lower prices. Also, the domestic firms may be able to learn from the operational and managerial procedures adopted in foreign firms. In the case where foreign firms buy from domestic suppliers, there are significant backward linkages in the same sector but not in other sectors. However, the backward linkages in the same sector has negative coefficient. In other words, intra-industry sales by domestic firms to foreign firms in the same industry seem to result in poorer domestic industry performance. Since UK has the inter-regional input-output tables which not all countries have this benefit (for example, Malaysia) Driffield et al. (2004) study the intra- and inter-regional externalities from the presence of foreign manufacturing together with intra- and inter-industry buyer-supplier relationships in UK manufacturing sector. The findings of Driffield et al. (2004) for backward linkages are the same

as Driffield et al. (2002) except that the inter-industry spillovers in other region has significantly negative result and inter-industry in the region has insignificant negative result. Both Driffield et al. (2004) and Driffield et al. (2002) find evidence that domestic firms benefit from purchasing from multinationals in the same industry and in other industries either in the same region or in other region except for the same industry in the same region and for different industries in different regions which are not significant but the coefficients are positive. The findings by Driffield et al. (2002, 2004) are different in the sense that the forward linkages increase the productivity of the local firms but the backward linkages do not enhance the productivity of the domestic firms.

Bitzer et al. (2008) argue that research on vertical linkages generally use micro-level data for one particular country which is considered as case study and therefore it is difficult to generalize. Hence, Bitzer et al. (2008) examine vertical and horizontal linkages for 17 OECD countries for the years 1989 to 2003 to arrive at more general conclusions on the importance of vertical linkages for productivity benefits from FDI. The study uses industry-level data from the OECD STAN database combine with input-output tables for OECD countries. Bitzer et al. (2008) find evidence of positive effects from horizontal FDI. There is also a statistically significant and positive spillover through backward linkages while there is no evidence of forward linkages. Bitzer et al. (2008) findings on backward linkages are consistent with the study of Javorcik (2004). The main conclusion from the study of Bitzer et al. (2008) is that the evidence for spillovers from backward linkages is indeed strong and there is evidence for spillovers through vertical backward linkages between multinationals and domestic firms. Bitzer et al. (2008) also find some evidence for positive horizontal effects from FDI.

Studies of FDI spillover effects on Malaysia as a host country and in particular vertical spillovers are quite limited (Iguchi, 2008). For example, Iguchi (2008) uses interviews to explore evidence of inter-organizational linkages between transnational corporation (TNC) subsidiaries and local suppliers in the Malaysian electrical and electronics industry. The study finds that characteristics of the subsidiaries such as autonomy, local sourcing rate and location are positively related to the intensity of backward linkages. Another study by Khalifah and Adam (2008) in the Malaysian electrical and electronic sector finds that wholly foreign-owned establishments have lower backward linkages with backward linkages measured as the share of intermediate inputs purchased locally (as opposed to imported inputs). Inward investment in terms of 100% foreign equity participation has a fairly low percentage of inputs sourced locally (Khalifah and Adam, 2008). Furthermore, Khalifah and Adam (2008) concludes that MNCs affiliates import intermediate goods from overseas and assemble for exports instead of sourcing locally, thus there is no incentive for MNCs to transfer technology to local suppliers.

3. Data and Methodology

3.1 Data Description

The data set employed in this study is based on the *Annual Survey of Manufacturing Industries*, conducted by the Department of Statistics (DOS), Malaysia for the year 2000-2004 (annual surveys except for census conducted in 2000). The annual surveys cover all establishments above a specific employment cut-off, which vary from industry to industry. There are 192 industries at the five-digit level, classified under the Malaysian Standard Industrial Classification (MSIC), 2000.

The principal statistics for each establishment compiled are type of ownership, foreign equity ownership, value of gross output, cost of inputs, value added, value of fixed assets and number of workers employed as well as the total wages paid during the year. Output is calculated as the value of sales less the change in inventories. Value added is taken to be the difference between the value of gross output and the cost of input. Capital stock is the stock of fixed assets reported by each establishment at the end of the reference year. Wages are the amount paid by each establishment including the amount paid to the part-time workers during the reference year. All the data have been deflated using the appropriate deflators. The value of gross output and cost of inputs respectively have been deflated using the Producer Price Index (PPI) and an intermediate input deflator at the 5-digit MSIC. The value of fixed assets are deflated using the Gross Domestic Product (GDP) deflator (Egger, 2000) while wages are deflated using the domestic economy PPI deflator.

The initial data set ranges from 20,455 establishments in 2000; 13,934 establishments in 2001; 13,482 establishments in 2002; 13,672 in 2003 and 12,451 establishments in 2004. Given that there are differences in the actual establishments sampled over the years, the selected sample for the final data set constitute of a balanced panel of 5329 establishments spanning over the period 2000-2004. In order to arrive at the 5329 establishments, we cleaned the data by eliminating the establishments with negative value added and those not being classified in the Input-Output (IO) table (industry above MSIC 37000). Table 1 below shows the percentage of value added for the balanced panel to total value added of all establishments included in the IO table.

Table 1: Percentage of Value Added for Sample Establishments

Year	2000	2001	2002	2003	2004
Total VA (establishments in IO table only – RM'000)	90,444,797	58,561,791	88,079,906	75,666,612	104,346,507
VA for balanced panel (5329 establishments – RM'000)	62,792,901	48,918,392	65,176,239	582,638,833	73,083,979
% of VA	69.4	83.5	74.0	77.0	70.0

Note: VA = value added
Source: Authors' calculations based on DOS data

Table 1 shows that the value added for the selected sample in this study ranges from 69.4% (during census year) to 83.5% of the total value added. We conclude that the selected sample is representative of the Malaysian manufacturing sector in terms of coverage of the value added.

All of the establishments are also categorized according to the different ownership groups. Local establishments denote establishments with less than 10% foreign ownership while wholly foreign ownership are establishments with 100% foreign ownership. There is balanced panel of 412 establishments with 100% foreign ownership and 4752 establishments with foreign ownership not equal to 100% foreign ownership. Out of the 4752 establishments, a balanced panel of 4125 establishments are considered as local establishments i.e. less than 10% foreign ownership.

3.2 Model Specification and Methodology

We estimate a production function for a full sample of an unbalanced panel using the semi-parametric approach suggested by Levinsohn and Petrin (2003) which corrects for endogeneity in determining inputs. This method addresses the issue of biasness in the ordinary least squares (OLS) estimates of production functions. The production function is estimated in log-linear form

by taking log values for the dependent variable (gross output, Q) and explanatory variables (intermediate inputs, Z; fixed assets, FA; labor, $WAGES$).

$$Q_{ijt} = f(Z_{ijt}, FA_{ijt}, WAGES_{ijt})$$

$$lnQ = f(lnZ, lnFA, lnWAGES) \quad (1)$$

Following Petrin et al. (2004), we calculate production functions for each industry at the MSIC 4-digit level using equation (1). Then, we estimate the TFP of each establishment which is the difference between actual output and predicted output (Javorcik, 2004, p. 619). After estimating the TFP, we then relate the TFP to the proxies of FDI participation which are the horizontal and vertical spillovers. Horizontal spillovers exist if domestic firms benefit from the presence of foreign firms operating in the same industry. Meanwhile, the vertical spillovers exist if domestic firms benefit from the presence of foreign firms operating in the other industry either upstream or downstream. The analysis reveals the effect of changes in horizontal and vertical spillovers on estimates of establishment productivity over the period of 2000-2004. A positive contribution from horizontal and vertical spillovers suggests a transfer of technology within (intra-) and across (inter-) industries respectively.

Adopting the specification (among others) by Javorcik (2004) and Javorcik and Spatareanu (2008), the model used to examine FDI spillovers is specified as follows:

$$TFP_{ijt} = f(FOR_{ijt}, HORIZONTAL_{ijt}, BACKWARD_{jt}, FORWARD_{jt}, SIZE_{ijt}, HHI_{jt}, AVGW_{ijt})$$

(2)

where subscripts *i, j* and *t* index all establishments, 5-digit industry codes and years respectively, for the total sample of manufacturing establishments. The explanatory variables include proxies for spillovers from FDI operating through horizontal, backward and forward channels. The horizontal spillovers ($HORIZONTAL_{jt}$) at the industry level measure the extent of foreign presence within the same industry weighted by either output (Q), fixed assets (FA) or wages (W).

$$HORIZONTAL_{jt} = \frac{\sum_{v \in j} Foreign\ Share_{it} * Q_{it}}{\sum_{v \in j} Q_{it}} \tag{3}$$

Establishment specific measure of horizontal spillovers $HORIZONTAL_{ijt}$, is derived by subtracting each establishment's foreign share in sectoral output from the industry level measure $HORIZONTAL_{jt}$, again weighted by either output, fixed assets or wages. The $HORIZONTAL_{jt}$ variable increases with increases in Q, FA or W in the establishment and also the foreign equity participation in the sector.

On the other hand, the vertical spillovers measure the extent of backward (*BACKWARD*) and forward spillovers (*FORWARD*) in the upstream and downstream sectors, respectively. A linkage coefficient is calculated using the Input-Output (IO) tables. In other words, to measure vertical linkages, the IO tables for 2000 are used together with the establishment data from Department of Statistics, Malaysia (DOS) for the years of 2000-2004. The MSIC 5-digit industries' foreign share is calculated based on weights in terms of output, fixed assets and wages. The industry by industry transactions matrix is used to measure linkages between industries. The linkage intensities are derived by dividing industry group purchases/sales from/to each industry by total Malaysian intermediate purchases/sales. The total Malaysian intermediate

purchases/sales exclude imported inputs and payments to labor. The exclusion of imported inputs in Malaysian IO table is in line with the suggestion by Javorcik (2004), that is, to use domestic intermediate inputs to measure linkages. The column vectors in the IO table show the sector purchases and sector sales appear in the row vectors (Driffield et al. 2002, p. 342). Ideally, in the estimation of vertical spillovers, multiple IO table for each corresponding year i.e. IO table 2000 for the data in year 2000, IO table 2001 for the data in year 2001 and subsequently should be used. However, the latest IO table produced by DOS at the time of this research is for the year 2000. As a result, this study uses IO table for 2000 and hold the linkage coefficients for vertical spillovers constant over the observation period (Bitzer et al., 2008).

Following Javorcik (2004) and Blalock and Gertler (2008), backward linkages are defined as follows:

$$BACKWARD_{jt} = \sum_{k \; if \; k \neq j} \alpha_{jk} * HORIZONTAL_{kt} \tag{4}$$

where α_{jk} is the proportion of sector j's output supplied to sector k taken from Malaysian's Input-Output table for the year 2000. Following Driffield et al. (2002), the forward linkage variable for industry j is measured as follows:

$$FORWARD_{jt} = \sum_{m \; if \; m \neq j} \delta_{jm} * HORIZONTAL_{mt} \tag{5}$$

where δ_{jm} is the share of inputs in total inputs purchased by industry j from industry m.

Other determinants of establishments' productivity include foreign share, labor quality, Herfindahl-Hirschman Index (*HHI*) and size of establishment. The foreign share (*FOR*) measures

the actual share of foreign equity of the establishments. Labor quality denoted by average wages per establishment (*AVGW*) measures the absorptive capability or human capital embodied in the local establishment (Kohpaiboon, 2009). In previous studies, Khalifah and Adam (2009) uses the ratio of white-collar workers to total workers to measure labor quality of an establishment. In cases where the establishment has one worker/owner, the ratio of white-collar workers to total number of workers will be unity, reflecting the highest labor quality possible for small establishments. In order to avoid this bias for small establishments, we measure the labor quality as the ratio of wages to total number of workers in each establishment (Aswicahyono and Hill, 1995). In cases where part-time workers are hired, two part-time workers are considered to equal one full-time worker. *HHI* is used to measure the degree of market competition at the five-digit industry level in terms of value added. Higher value of *HHI* indicates higher degree of industry concentration and thus less competition.

According to Biesebroeck (2005), large firms improve productivity faster while the smaller firms find difficulty in advancing in size or productivity distribution. This may be due to large firms experiencing economies of scale and are more likely to be self sufficient (Khalifah and Adam, 2008). Thus a positive relationship is expected between establishment size and productivity. In this study, *SIZE* is measured as establishment value added normalized by average value added for the respective industries.

4. Empirical Analysis

A summary of the data classified according to 2-digit MSIC for the Malaysian manufacturing sector in the year 2004 is provided in Table 2. Approximately one-third of Malaysia's

manufacturing output was produced by 248 wholly owned foreign establishments in the electrical and electronic sector. These wholly foreign-owned establishments also produced 28% of Malaysia's manufacturing value added, employed 20% of the total number of workers, paid 22% of the total wages in the manufacturing sector but only utilized 11.7% of the fixed assets in the manufacturing sector, resulting in a capital labor (*K/L*) ratio of 212.0 against the *K/L* ratio of 263.0 and 239.1 for establishments with shared and local ownership respectively in the electrical and electronics sector.

The main econometric results of this study of the determinants of TFP, for the overall manufacturing sector and the sub-sample of wholly foreign-owned establishment are shown in Table 3[1]. Models 1A to 1F of Table 3 shows both *FOR* (percentage foreign equity in an establishment) and *D100* (dummy for wholly foreign-owned establishment) are not significant i.e. neither actual foreign equity share nor wholly foreign ownership are significant in explaining TFP. As for other explanatory variables, *SIZE* and labor quality (*AVGW*) are significant and positively affect TFP while market concentration (*HHI*) is significant and negatively affect TFP. We find no evidence of significant horizontal spillover for the main variables of interest both in terms of *FPW* and *FPQ*. The findings of this current study are consistent with those of Javorcik (2004) who found no evidence of positive horizontal spillovers. However, there is a positive and significant horizontal spillover in terms of *FPFA*. This result is consistent with the empirical study on spillovers of Khalifah and Adam (2009) on Malaysia using labor productivity as the dependent variable.

[1] The Breusch and Pagan Lagrangian multiplier test is significant (p =0.0000) and Hausman test is also significant (p=0.0000) and thus indicate that the fixed effects model is the best model selected compared with pooled least squares and random effects.

Table 2: Summary of Malaysian Manufacturing Sector for the Year 2004

DIG2++	O/ship	# Estb.	%*Q*	%*VA*	%*WAGES*	%*FA*	%*L*	K/L	AvgW	Q/K	Q/L
15, 16	Who	40	0.9	0.4	0.6	0.8	0.4	821.2	76.1	5.5	1,693.1
	Join.	109	1.8	2.2	1.5	1.4	1.2	209.1	33.4	8.7	872.1
	Loc.	2116	7.4	5.0	5.8	5.7	7.6	174.3	24.7	6.4	565.8
17, 18, 19	Who	50	0.4	0.5	0.9	0.4	1.2	108.5	42.8	14.4	418.9
	Join.	62	0.9	1.0	1.7	2.1	2.2	292.1	48.3	8.0	452.6
	Loc.	1268	0.8	1.1	2.4	1.0	3.7	101.7	36.6	9.2	267.2
20, 21, 22	Who	70	0.5	0.6	0.9	0.7	1.3	222.3	44.0	6.3	491.4
	Join.	99	0.7	0.9	1.4	1.2	1.7	372.8	61.2	5.6	612.1
	Loc.	1521	3.5	4.7	7.5	7.2	9.3	346.4	50.4	4.8	475.2
23, 24	Who	65	1.2	0.9	1.1	1.5	0.6	304.5	34.9	2.5	747.5
	Join.	130	9.3	10.8	2.8	20.5	1.2	10,672.2	113.3	3.0	17,678.0
	Loc.	372	6.1	6.7	3.0	10.3	1.9	1,820.2	66.2	7.4	8,738.0
25	Who	117	1.1	1.4	2.3	1.3	2.6	59.7	16.1	2.7	158.4
	Join.	162	1.2	1.2	2.3	1.7	2.6	77.5	16.2	2.2	170.9
	Loc.	782	2.6	2.5	5.1	2.9	6.3	55.5	14.5	2.8	153.9
26	Who	37	0.5	0.9	0.8	0.9	0.6	178.7	24.2	1.9	332.1
	Join.	40	0.4	0.7	0.6	0.9	0.5	218.7	21.8	1.2	260.0
	Loc.	576	1.6	2.4	2.7	4.4	2.6	202.0	19.0	1.1	232.1
27, 28	Who	92	1.0	1.3	1.3	1.1	1.1	255.1	45.7	5.9	754.3
	Join.	137	1.9	1.2	2.0	2.0	1.5	316.5	46.9	6.2	963.0
	Loc.	1433	3.3	3.2	4.9	4.9	4.6	328.0	40.5	4.5	660.9
29	Who	59	1.1	1.5	1.4	0.8	1.0	96.3	27.4	4.7	448.0
	Join.	39	0.5	0.6	0.7	0.2	0.5	53.2	26.6	8.1	428.8
	Loc.	576	0.9	1.6	1.8	0.8	1.7	52.7	19.2	3.8	200.8
30, 31,32	Who	248	32.9	28.0	22.0	11.7	19.6	212.0	59.4	26.2	1,916.4
	Join.	88	2.0	2.4	3.2	2.8	2.8	263.0	60.2	22.2	1,045.1
	Loc.	282	6.9	6.8	6.6	3.2	5.9	239.1	59.7	40.1	4,005.7
33	Who	24	1.0	1.3	1.6	0.5	1.5	40.3	19.6	6.5	262.5

DIG2[++]	O/ship	# Estb.	%*Q*	%*VA*	%*WAGES*	%*FA*	%*L*	K/L	AvgW	Q/K	Q/L
	Join.	5	0.1	0.1	0.1	0.1	0.1	52.2	19.6	3.8	195.6
	Loc.	19	0.2	0.3	0.2	0.0	0.2	27.2	15.3	13.8	374.8
34	Who	10	0.1	0.1	0.2	0.1	0.2	58.3	17.1	3.2	185.0
	Join.	27	3.1	2.1	2.0	2.6	1.6	202.6	22.7	3.7	753.3
	Loc.	172	0.9	1.4	1.3	0.8	1.3	77.5	18.4	3.5	268.8
35	Who	8	0.3	0.3	0.3	0.1	0.3	54.1	18.1	6.9	372.6
	Join.	22	0.4	0.6	0.4	0.4	0.3	133.1	22.2	3.6	477.6
	Loc.	136	0.5	0.9	1.7	0.7	1.4	60.4	22.4	2.4	144.2
36, 37	Who	60	0.3	0.4	0.8	0.3	1.0	115.6	25.6	9.0	586.9
	Join.	58	0.2	0.3	0.6	0.3	0.7	47.5	14.7	2.9	138.8
	Loc.	1095	1.3	1.6	3.3	1.5	4.7	96.1	27.5	7.4	371.2
%TOT. MFG.	Who	7.2	41.2	37.6	34.3	20.2	31.4	77.5	19.8	6.5	500.0
	Join.	8.0	22.6	24.2	19.4	36.3	17.1	256.0	20.6	2.0	503.3
	Loc.	84.8	36.2	38.2	46.3	43.5	51.5	101.7	16.3	2.6	267.3
RM'mil.[+]	Total	12,206	506.9	104.4	24.2	160.4	1.3	120.4	18.2	3.2	380.7

Notes:

Who = wholly (100% foreign ownership), Join = joint (10%≤foreign ownership≤99%), Loc = local (less than 10% foreign ownership);

Estb. = No. of establishments.

[+] In the last line of the table, # of establishment shows actual number and labor shows number of workers in millions with 2 part-time workers equivalent to 1 full-time worker.

[++]DIG2 refers to two digit industries with 15, 16 - Food, Beverages, Tobacco; 17, 18, 19 - Textiles, Apparels, Footwear, Leather; 20, 21, 22 - Wood, Paper, Publishing; 23, 24 - Chemical, Petroleum; 25 - Rubber, Plastic; 26 - Glass; 27, 28 - Iron, Metal; 29 – Machinery; 30, 31,32 - Electrical, Electronics; 33 - Medical, Photographic; 34 – Automotive; 35 - Ship, Aircraft; 36, 37 -Furniture, Waste, Scrap

In the last three columns of Table 3 (models 2A-2C), the sub-sample of wholly foreign ownership (balanced panel=412), *FOR* equals to 100%, shows there is positive and significant evidence of horizontal spillovers for all proxies. As we already noted in Table 2, the wholly foreign establishments are mostly establishments in the electrical and electronic (E&E) industries. These establishments in the E&E sector that are wholly foreign-owned tend to be more labor-intensive in their production and are mostly for export-promotion (EP) compared to import substitution (IS) industries where the latter are more capital intensive such as the automobile and steel industry. At the same time, there are significant positive backward linkages and negative forward linkages for all proxies in the overall manufacturing and wholly foreign-owned sub-sample.

Our main variable of interest in terms of backward linkages, *BWINTER*, *BFAINTER* and *BQINTER* respectively, representing foreign equity weighted in terms of wages, fixed assets and output shows significant positive productivity spillovers arising from contacts between foreign customers and domestic suppliers in the different industries in the IO table. The forward linkage variable, *FWINTER*, *FFAINTER* and *FQINTER* where foreign presence is respectively weighted by wages, fixed assets and output shows a significant negative sign. This result is consistent in both the overall sample and sub-sample of wholly foreign-owned establishment. This finding is similar to that of Javorcik (2004). A plausible explanation is that higher foreign presence in industries where locals are using the inputs of foreign suppliers result in higher prices of inputs due to higher technology embodied in the inputs but that this technology does not benefit the

Table 3: Regression Results of Productivity Determinants

	ALL ESTABLISHMENTS						Sub-sample: WHOLLY, FOR=100%		
	FE						FE		
	1A	1B	1C	1D	1E	1F	2A	2B	2C
Dep. Var.	TFP (Levinsohn Petrin productivity estimator)								
C	3.10 (118.71)[a]	3.12 (125.50)[a]	3.11 (130.56)[a]	3.09 (120.57)[a]	3.11 (127.74)[a]	3.11 (133.08)[a]	3.71 (25.43)[a]	3.99 (28.66)[a]	3.92 (29.68)[a]
FOR	-0.05 (-1.21)	-0.05 (-1.34)	-0.05 (-1.24)						
D100				-0.06 (-1.48)	-0.07 (-1.58)	-0.07 (-1.56)			
BWINTER	0.000024 (7.57)[a]			0.000024 (7.58)[a]			0.0000412 (4.25)[a]		
FWINTER	-0.0000599 (-13.45)[a]			-0.0000598 (-13.44)[a]			-0.0000921 (-8.95)[a]		
FPWINTRA	0.05 (0.99)			0.05 (0.98)			1.33 (6.17)[a]		
BFAINTER		0.00000395 (5.99)[a]			0.00000395 (6.00)[a]			0.00000577 (2.57)[b]	
FFAINTER		-0.00000696 (-8.36)[a]			-0.00000695 (-8.35)[a]			-0.00000771 (-3.57)[a]	
FPFAINTRA		0.09 (2.07)[b]			0.09 (2.06)[b]			0.68 (3.70)[a]	
BQINTER			0.00000087 (8.53)[a]			0.000000872 (8.54)[a]			0.00000139 (4.87)[a]
FQINTER			-0.00000238 (-13.36)[a]			-0.00000237 (-13.35)[a]			-0.00000345 (-8.48)[a]
FPQINTRA			0.04 (0.87)			0.04 (0.87)			0.81 (4.16)[a]
HHI	-0.20 (-2.69)[a]	-0.22 (-2.87)[a]	-0.21 (-2.85)[a]	-0.20 (-2.67)[a]	-0.21 (-2.87)[a]	-0.21 (-2.84)[a]	-1.77 (-6.08)[a]	-1.68 (-5.58)[a]	-1.78 (-6.00)[a]
SIZE	0.01 (7.73)[a]	0.01 (7.91)[a]	0.01 (7.78)[a]	0.01 (7.74)[a]	0.008 (7.92)[a]	0.008 (7.78)[a]	0.01 (2.40)[b]	0.01 (2.12)[b]	0.01 (2.17)[b]
AVGW	0.002 (2.27)[b]	0.002 (2.25)[b]	0.002 (2.20)[b]	0.002 (2.29)[b]	0.002 (2.26)[b]	0.002 (2.22)[b]	0.0009 (0.24)	0.0007 (0.18)	0.0005 (0.13)
R^2	0.96	0.95	0.96	0.96	0.95	0.96	0.96	0.96	0.96
Adjusted R^2	0.94	0.94	0.94	0.94	0.94	0.94	0.95	0.95	0.95
Cross section	5329	5329	5329	5329	5329	5329	412	412	412
Balanced Observations	26645	26645	26645	26645	26645	26645	2060	2060	2060

Notes: a, b and c denote significant at the 1%, 5% and 10%, respectively, with t-statistics in parentheses. FE denotes fixed effects.

locals and thus not commensurate with the higher cost (see Javorcik, 2004). *SIZE* as usual positively affects TFP. Market concentration measured by the Herfindahl-Hirschman Index (*HHI*) negatively affects TFP for both the overall sample as well as sub-sample of wholly foreign-owned establishments. However, we find a non-significant coefficient for labor quality in equations 2A, 2B and 2C of Table 3. In other words, labor quality (*AVGW*) is not significant in explaining TFP in the wholly foreign-owned establishments. A possible explanation for this result is that wholly foreign-owned establishments are interested in the location advantages in Malaysia especially that of cheap labor relative to the ownership or internalization advantage of FDI in Dunning's (1977) OLI framework.

Next, we examine the issue of whether joint ownership between locals and foreign lead to greater linkages compared to wholly foreign-owned establishments. Table 4 presents the results of regressing the same model with sub-sample for all the other establishments (both foreign and domestic) excluding the wholly foreign-owned establishments (*FOR*=100%). The first three columns of Table 4 (models 3A-3C) show *FOR* is not significant for establishments other than 100% foreign equity (balanced panel=4752). As for the other variables, *SIZE* and *AVGW* are both positive and significant in affecting TFP. One interesting finding is that market concentration is also positive and significant. The results of sub-samples of establishments with joint foreign and local ownership (models 3A-3C, Table 4) or local ownership only (models 4A-4C, Table 4) indicate that in more concentrated industries where there is imperfect competition among establishments; the productivity of the establishments increase with market power. These results are contrary to the results for all establishments and wholly foreign-owned sub-sample (in Table 3). In other words, the result for the overall sample is being "driven" by the negative sign

Table 4: Regression Results of Productivity Determinants for Sub-sample

	Sub-sample: FOR not 100%			Sub-sample: Domestic (FOR < 10%)		
	3A	3B	3C	4A	4B	4C
Dep. Var.	TFP (Levinsohn Petrin productivity estimator)					
C	3.03 (119.30)[a]	3.03 (125.24)[a]	3.04 (129.84)[a]	2.96 (117.98)[a]	2.96 (122.55)[a]	2.98 (127.77)[a]
FOR	0.02 (0.25)	0.01 (0.16)	0.02 (0.23)			
BWINTER	0.0000041 (1.19)			0.00000932 (2.60)[b]		
FWINTER	-0.0000215 (-3.56)[a]			-0.0000289 (-4.10)[a]		
FPWINTRA	-0.12 (-2.43)[b]			-0.08 (-1.44)		
BFAINTER		0.00000122 (1.76)[b]			0.00000207 (2.82)[a]	
FFAINTER		-0.00000625 (-6.06)[a]			-0.00000584 (-4.91)[a]	
FPFAINTRA		0.01 (0.31)			0.05 (1.11)	
BQINTER			0.000000051 (0.44)			0.000000306 (2.45)[b]
FQINTER			-0.000000862 (-3.54)[a]			-0.00000122 (-4.34)[a]
FPQINTRA			-0.10 (-2.02)[b]			-0.07 (-1.38)
HHI	0.19 (2.52)[b]	0.14 (1.87)[b]	0.18 (2.20)[b]	0.04 (0.54)	-0.003 (-0.03)	0.03 (0.37)
SIZE	0.01 (7.34)[a]	0.01 (7.56)[a]	0.01 (7.37)[a]	0.01 (5.02)[a]	0.006 (5.22)[a]	0.006 (5.01)[a]
AVGW	0.003 (2.70)[b]	0.003 (2.74)[b]	0.003 (2.74)[b]	0.002 (1.29)	0.002 (1.30)	0.002 (1.30)
R^2	0.95	0.95	0.95	0.95	0.95	0.95
Adjusted R^2	0.94	0.94	0.94	0.94	0.94	0.94
Cross section	4752	4752	4752	4125	4125	4125
Balanced Observations	23,760	23,760	23,760	20,625	20,625	20,625

Note: a, b and c denote significant at the 1%, 5% and 10%, respectively, with t-statistics in parentheses.

of the wholly foreign-owned sub-sample for the *HHI* variable where in the wholly owned foreign sub-sample higher industrial concentration leads to "complacency" and lower TFP.

The main variables of interest in models 3A and 3C of Table 4 show negative and significant horizontal spillovers using both proxies of wages and output. However, there is no evidence of horizontal spillovers in terms of fixed assets in this sub-sample of joint and local

ownership. This is in contrast with both the all establishments and wholly foreign-owned sub-sample (in Table 3) where there is insignificant horizontal spillover effect when foreign is weighted in terms of wages and output. Another important finding is that we still find negative and significant forward linkages for all proxies for sub-sample other than 100% foreign equity share. However, there is only positive and significant vertical spillover for backward linkages where foreign is weighted in terms of fixed assets (model 3B, Table 4) but not when foreign is weighted in terms of wages and output. There exists backward linkage in the sub-sample other than wholly foreign-owned establishments when "foreignness" is denoted in terms of fixed assets. When foreign is weighted by wages and output, there is no significant backward spillover effect.

The results for sub-sample of domestic establishments only in models 4A-4C, Table 4 (with *FOR*<10%, balanced panel = 4125) shows that there is no evidence of positive horizontal spillovers. However, there are significant evidences of positive backward linkages and negative forward linkages for all proxies. Both market concentration and labor quality are not significant in explaining productivity of domestic establishments. However, *SIZE* is still positive and significant. The positive effect of size on TFP reflects the ability of large establishments to increase TFP or that scale economies generates productivity.

One unanticipated finding is that labor quality proxied by average wages in Table 4 for sub-sample *FOR-not-100 percent* is positive and significant for all three measures of foreign presence. However, for wholly foreign-owned enterprises labor quality is not significant (Table 3). As mentioned earlier the result may indicate that the assembly operations of plants operating

with 'cheap labor' are driving this result. Average wages can also be used to denote absorptive capabilities of workers. In wholly foreign-owned establishments, absorptive capability does not affect TFP akin to that of domestic establishments. Thus the result for the overall sample that higher labor quality affects TFP is being driven by the sample of foreign establishments with joint ownership.

Intra-industry spillovers measured in terms of wages (*FPW*) and output (*FPQ*) for establishments not 100% foreign ownership (*FOR-not-100*), negatively affects TFP while horizontal spillovers measured in terms of fixed assets (*FPFA*) are not significant. This finding may suggest some market stealing effect from foreign presence or crowding out effect for *FPW* and *FPQ*. This result for the sub-sample not wholly foreign-owned contrasts that of establishments with wholly foreign 100% ownership (*FOR100*), where in the latter *FPW* and *FPQ* positively affect TFP and *FPFA* is also positive and significant. Therefore, the negative for *FOR-not-100* and positive for *FOR100* offset each other leaving it being not significant for the overall sample for *FPW* and *FPQ*. The positive and significant coefficient of *FPFA* for the overall sample is the result from *FOR100* being significant for the wholly foreign-owned sub-sample and *FPFA* not significant from the sub-sample of *FOR-not-100*. For the local sub-sample there is no horizontal spillover effects for foreign presence in an industry irrespective of the proxies used in measuring "foreignness".

Based on these results, we conclude that if "foreignness" is denoted in terms of fixed assets, then there exist positive backward linkages and negative forward linkage and horizontal spillovers for the overall sample and sub-sample of wholly foreign-owned establishments. In the

sub-sample *FOR-not-100*, backward linkages are insignificant when foreign is weighted in terms of wages and output and significant and positive when "foreignness" is denoted in terms of capital. Spillovers from foreign presence within an industry are negative and significant when foreign is weighted in terms of wages and output and insignificant when weighted in terms of capital. In the case of domestic establishments, there are significant positive spillovers from backward linkages, negative spillovers from forward linkages, and the absence of horizontal spillovers. Another robust result is that *SIZE* positively influences TFP in all the sub-samples as well as overall sample.

5. Concluding Remarks

This paper has examined empirically FDI spillovers as the determinants of productivity in the Malaysian manufacturing sector. Using a balanced panel data set for the years 2000-2004, size of establishments is found significant in determining TFP. This indicates there are scale economies for all establishments, foreign and local. All forward linkages negatively affect TFP. The result for forward linkages and size are robust for the overall sample and sub-samples categorized according to the extent of foreign ownership. The local sub-sample has the most observations but three variables are not significant i.e. horizontal or intra-industry spillovers, market concentration and labor quality. It is interesting that labor quality does not affect TFP of local establishments akin to that of wholly foreign owned establishments.

The initial result shows there is significant and positive backward linkages for the overall sample, the wholly foreign-owned sub-sample and the domestic establishments sub-sample for all three measurements of FDI spillovers i.e. labor (wages), capital (fixed assets) and output.

Backward linkages for the sub-sample of joint ownership (including domestic ownership) shows insignificant backward vertical spillovers when foreign presence in the purchasing industries supplied by locals is measured in terms of wages and output. When "foreignness" is associated with capital and embodiment of "technology" in capital, then backward spillovers occur when foreign purchasers demand "high-quality" intermediate products from local suppliers.

The intuition for this result can be grasped by looking at the bottom of Table 2. The sample of establishments with shared ownership uses 36% of capital and pays 19% of wages and produces 23% of gross output respectively of the manufacturing sector rendering production more capital intensive than wholly foreign-owned establishments using 20% of capital, paying 34% of wages and producing 41% of output of the manufacturing sector. The results on the presence or absence of vertical and horizontal spillover effects are sensitive to the degree of foreign ownership in a non-linear fashion in the establishments. The production process in wholly foreign-owned establishments is labor intensive generating positive backward linkages and intra-industry spillovers and negative forward linkages. The electrical and electronic sector with a proliferation of wholly foreign-owned establishments can be considered as labor intensive or less technology intensive sector with absorptive capacity or labor quality not influencing TFP. Higher industry concentration or market power reduces productivity in the less technology intensive sector.

Higher industrial concentration and higher labor quality enhances TFP in establishments with joint ownership. This result supports the usual perception that market power curtails competition and enhances profits and TFP. Overall the negative *HHI* sign for the total sample is

being driven by wholly foreign-owned establishments indicating that foreign establishments are being complacent with increasing market power or negative competitive effect.

In the case of shared ownership, horizontal spillovers are non-existent when foreign presence is measured in terms of capital. However, horizontal spillovers are negative and significant when foreign presence is measured in terms of wages and output. Crowding out or market stealing effect occurs when foreign is weighted in terms of wages and output. Also, in *FOR-not-100,* absorptive capacity (labor quality) measured in terms of average wages is important in determining TFP. In the sub-sample of wholly foreign-owned establishments, intra-industry spillovers are positive for all proxies of foreign presence. In the sub-sample of domestic establishments, there does not exists any horizontal spillover effect. In the overall sample, the results are an "aggregation" of the results for the different sub-samples – foreign presence within an industry positively influences TFP when weighted in terms of capital and insignificant when weighted in terms of wages and output. Similarly, in the overall sample, labor quality is significant in determining establishment TFP thanks to the establishments with joint ownership.

Previous policies of the Malaysian government allowing for 100% foreign ownership in establishments that export greater than 80% of their output (the so called export-oriented industrialization) led to a proliferation of wholly foreign-owned establishments in the E&E sector in which production is relatively labor intensive (probably assembly activities). If we assume that wholly foreign-owned establishments reflect that of the electrical and electronic sector which is labor intensive or less technology intensive, then there are positive backward linkages and intra-industry spillovers and negative forward linkages irrespective of the weights

used in measuring foreign participation. The results suggest that both horizontal and backward vertical spillovers exist in industries with a lower technological sophistication.

If we assume shared ownership reflects the chemical and petroleum sector, then there are insignificant backward linkages weighted in terms of wages and output and positive backward linkages when foreign is weighted in terms of capital. The chemical and petroleum industries are highly capital intensive (and resource intensive, especially for petroleum) sectors and can be regarded as the offspring of the import-substitution industrialization phase in Malaysia's development. Foreign presence within industries measured in terms of capital has insignificant effects on TFP suggesting that local establishments do not have the capacity to imitate the foreign capital-intensive technology. Moreover, foreign presence within industries weighted by wages and output "squeezes" the establishments in technology or capital intensive sectors. Thus, it is the factor proportions or technological intensity in production in the different industries as well as different proxies for foreign involvement that influence horizontal and vertical spillovers from FDI together with labor quality, size and market structure that jointly determine TFP for the overall sample and not just the extent of foreign ownership *per se*.

Appendix

Table A1: Definition of Variables

Variable	Definition
Productivity (*Q*) – dependent variable	Real output in terms of gross output of each establishment (RM'000).
Fixed Assets/Capital (*FA*)	Value of fixed assets or capital stock at year end (net of depreciation) (RM'000).
Labor *(WAGES)*	Total wages paid during the year (RM'000).
Intermediate inputs (*Z*)	Total intermediate inputs reported during the year (RM'000).
Horizontal spillover-Foreign Presence: (*FPQINTRA, FPFAINTRA, FPWINTRA)*	Extent of foreign presence proxied by gross output (Q), capital (FA) or wages (W) shares of foreign equity to total gross output, capital or wages respectively of the industry.
Vertical spillover (Q/WAGES/FA): *BQINTER/ BWINTER/ BFAINTER/ FQINTER/ FWINTER/ FFAINTER*	Backward and forward spillover measured in terms of gross output (Q) OR fixed assets (FA) OR wages (WAGES). *BQINTER* = Backward measured in terms of gross output. *BWAGESINTER* = Backward measured in terms of wages paid during the year. *BFAINTER* = Backward measured in terms of value of fixed assets at year end (net of depreciation). *FQINTER* = Forward measured in terms of gross output. *FWAGESINTER* = Forward measured in terms of wages paid during the year. *FFAINTER* = Forward measured in terms of value of fixed assets at year end (net of depreciation).
Market Concentration *(HHI)*	Herfindahl-Hirschman index (*HHI*) for each industry is calculated as the sum of squared market shares (in terms of value added) of all establishments in an industry, i.e. $=\Sigma_i (VA_i / VA_j)^2$ where *i* indicates establishment and *j* indicates the 5-digit industry classification. A scale of zero to one, where a unit value is obtained in the case of a monopoly.
Establishment Size *(SIZE)*	Value added (*VA*) of each establishment divided by industry average value added (VA_i / VA_j).
Labor quality *(AVGW)*	The ratio of wages to total workers in each establishment.

Table A2: Statistical Summary of the Key Variables (Full sample)

	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
FOR	0.15	0	1	0	0.328	26645
BWINTER	4766	2300	27148	0.611	6104.9	26645
FWINTER	1242	570.62	32346	5.48	3157.3	26645
BFAINTER	20085	10406.9	122274	2.93	25370	26645
FFAINTER	9926	5099.62	148600	47.18	16627	26645
BQINTER	112038	56242.46	660740	9.13	145583	26645
FQINTER	29551	14392.56	761958	121.92	69823	26645
FPQINTRA	0.282	0.245	0.997	0	0.212	26645
FPWINTRA	0.260	0.225	0.997	0	0.199	26645
FPFAINTRA	0.274	0.232	0.995	0	0.216	26645
AVGW	14.14	12.586	162.73	0	9.838	26645
HHI	0.1007	0.058	0.955	0.006	0.112	26645
SIZE	1.714	0.487	431.40	6.26E-06	5.186	26645

Source: Authors' computations.

Table A3: Correlation matrix of the Variables

	FOR	*BW-INTER*	*FW-INTER*	*BFA-INTER*	*FFA-INTER*	*BQ-INTER*	*FQ-INTER*	*FPQ-INTRA*	*FPW-INTRA*	*FPFA-INTRA*	*AVGW*	*HHI*	*SIZE*	*LNQ*	*LN-WAGES*	*LN-FA*	*LNZ*	*TFP-LP*	*D100*
FOR	1.00																		
BWINTER	0.16	1.00																	
FWINTER	0.25	0.08	1.00																
BFAINTER	0.14	0.97	0.07	1.00															
FFAINTER	0.31	0.17	0.90	0.18	1.00														
BQINTER	0.20	0.97	0.14	0.94	0.26	1.00													
FQINTER	0.25	0.12	0.98	0.12	0.91	0.17	1.00												
FPQINTRA	0.30	0.26	0.37	0.22	0.41	0.32	0.36	1.00											
FPWINTRA	0.33	0.24	0.40	0.19	0.45	0.29	0.39	0.96	1.00										
FPFAINTRA	0.28	0.24	0.35	0.20	0.39	0.29	0.33	0.94	0.93	1.00									
AVGW	0.31	0.20	0.10	0.21	0.15	0.21	0.13	0.13	0.14	0.09	1.00								
HHI	0.04	-0.01	0.02	-0.02	0.00	-0.01	0.04	0.25	0.25	0.26	0.09	1.00							
SIZE	0.16	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.05	-0.05	-0.05	0.22	-0.02	1.00						
LNQ	0.44	0.16	0.22	0.18	0.32	0.19	0.25	0.17	0.20	0.14	0.62	0.01	0.33	1.00					
LNWAGES	0.31	0.11	0.15	0.11	0.21	0.13	0.17	0.11	0.13	0.08	0.52	-0.01	0.23	0.75	1.00				
LNFA	0.35	0.15	0.14	0.16	0.22	0.17	0.17	0.12	0.14	0.10	0.54	0.01	0.27	0.84	0.68	1.00			
LNZ	0.43	0.15	0.21	0.17	0.31	0.18	0.24	0.15	0.19	0.13	0.60	0.00	0.32	0.99	0.73	0.83	1.00		
TFPLP	0.15	0.13	-0.01	0.10	0.01	0.14	-0.02	0.12	0.12	0.10	0.17	0.00	0.16	0.23	0.17	0.17	0.21	1.00	
D100	0.84	0.13	0.24	0.11	0.29	0.18	0.23	0.28	0.30	0.27	0.20	0.02	0.12	0.34	0.23	0.26	0.33	0.12	1.00

Source: Authors' computations.

References

Aswicahyono, H. H. and Hill, H., 1995, Determinants of Foreign Ownership in LDC Manufacturing: An Indonesian Case Study. *Journal of International Business Studies*, **26**(1), pp. 139-58.

Barrios, S and Strobl, E., 2002, Foreign Direct Investment and Productivity Spillovers: Evidence from the Spanish Experience. *Weltwirtschaftliches Archiv*, **138**(3), pp. 459-81.

Biesebroeck, J. V., 2005, Firm Size Matters: Growth and Productivity Growth in African Manufacturing. *Economic Development & Cultural Change*, **53**(3), pp. 545-83.

Bitzer, J., Geishecker, I. and Görg, H., 2008, Productivity Spillovers through Vertical Linkages: Evidence from 17 OECD Countries, *Economics Letter*, **99**, pp. 328-31.

Blalock, G. and Gertler, P. J., 2008, Welfare Gains from Foreign Direct Investment Through Technology Transfer to Local Suppliers, *Journal of International Economics*, **74**, pp. 402-21.

Department of Statistics, Malaysia (DOS). 2005, *Input Output Tables Malaysia 2000*.

Driffield, N., Munday, M. and Roberts, A., 2002, Foreign Direct Investment, Transactions Linkages, and the Performance of the Domestic Sector. *International Journal of the Economics of Business*, **9**(3), pp. 335-51.

Driffield, N., Munday, M. and Roberts, A., 2004, Inward Investment, Transactions Linkages, and Productivity Spillovers. *Regional Science*, **83**, pp. 699-722.

Dunning, J. (1977). Trade, Locaton of Economic Activity and MNE: A Search for the Eclectic Approach. In Ohlin, Hesselborn and Wijkman, eds., *The International Allocation of Economic Activity*. London: Macmillan.

Egger, P., 2000, A note on the proper econometric specification of the gravity equation. *Economics Letters*, pp. 25-31.

Iguchi, C., 2008, Determinants of Backward Linkages: The Case of TNC Subsidiaries in Malaysia. *Asian Business & Management*, **7**, pp. 53-73.

Javorcik, B. S., 2004, Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages. *The American Economic Review*, **94**(3), pp. 606-27.

Javorcik, B. S. and Spatareanu, M, 2008, To Share or Not To Share: Does Local Participation Matter for Spillovers from Foreign Direct Investment? *Journal of Development Economics*, **85**, pp. 194-217.

Khalifah, N. A. and Adam, R. 2008, Comparison of Backward Linkages Between Foreign and Local Establishments in the Malaysian Electrical and Electronics Sector. Paper presented at the 11th International Convention of the East Asian Economic Association 15-16 November 2008, Manila.

Khalifah, N. A. and Adam, R., 2009, Productivity Spillovers from FDI in Malaysian Manufacturing: Evidence from Micro-panel Data. *Asian Economic Journal*, **23**(2), pp. 143-67.

Kohpaiboon, A., 2009, Vertical and Horizontal FDI Technology Spillovers: Evidence from Thai Manufacturing. *ERIA Discussion Paper Series ERIA-DP-2009-08*.

Kugler, M., 2006, Spillovers from Foreign Direct Investment: Within or Between Industries? *Journal of Development Economics*, **80**, pp. 444-477.

Levinsohn, J. and Petrin, A., 2003, Estimating production functions using inputs to control for unobservables. *Review of Economic Studies*, **70**(2), pp. 317-42.

Malaysia Industrial Development Authority (MIDA), 2008, Invest in Malaysia, Getting Started: Guidelines on Equity Policy. [online; cited 5 Mac 2009.] Available from URL: http://www.mida.gov.my/en_v2/index.php?page=guidelines-on-equity-policy.

Petrin, A, Poi, B. P. and Levinsohn, J., 2004, Production function estimation in Stata using inputs to control for unobservables. *The Stata Journal*, **4**(2), pp. 113-23.

Rodrîguez-Clare, A., 1996, Multinationals, Linkages, and Economic Development. *American Economic Review*, **86**(4), pp. 852-73.

Smeets, R., 2008, Collecting the Pieces of the FDI Knowledge Spillovers Puzzle. *The World Bank Research Observer*, **23**(2), pp. 107-38.

United Nations Conference on Trade & Development (UNCTAD) 2001, *World Investment Report 2001: Promoting Linkages.* Geneva: UNCTAD.

Program for the 12th International Convention of the East Asian Economic Association

Venue: Ewha Womans University, Seoul

October 2nd (Saturday), 2010

08:30~09:00 Registration (Lobby of LG Convention Hall)

09:00~09:10 Opening Session (LG Convention Hall)
Welcoming Address: Jang-Hee Yoo, (President of EAEA)

09:10~10:00 Keynote Address (LG Convention Hall)
Speaker: Peter Drysdale (Professor Emeritus, Australian National University)
Asia's Global Responsibilities and Regional and International Cooperation

10:00-10:30 Coffee Break (Lobby of LG Convention Hall)

10:30~12:30 Concurrent Session 1

CS1-A ERIA-1: Economic Consequences of Globalization in East Asia: Evidence from Micro Data Analyses
Chair: Shujiro Urata (ERIA, Waseda University)
1. Toshiyuki Matsuura and Kazunobu Hayakawa: The Role of Trade Cost on FDI Strategy in Heterogeneous Firms: Evidence from Japanese Firm-level Data
2. Chin Hee Hahn and Yong-Seok Choi: The Effects of Imported Intermediate Varieties on Plant Total Factor Productivity and Product Switching: Evidence from Korean Manufacturing
3. Dionisius Narjoko: Policy Reforms, Firm Entry, and Labor Productivity Change: Learning from the Vietnamese Manufacturing
4. Rafaelita Aldaba: Does Trade Protection Improve Firm Productivity? Evidence from Philippine Micro Data

Discussants:
1. Dionisius Narjoko
2. Rafaelita Aldaba
3. Kazunobu Hayakawa
4. Chin Hee Hahn

CS1-B ADB Session: Financial Globalization
Chair: Jong Wha Lee
1. Hiro Ito and Akiko Terada-Hagiwara: An Analysis of the Effects of Financial Market Imperfections on Indian Firms' Exporting Behavior
2. Joshua Aizenman, Yothin Jinjarak, and Donghyun Park: Interational reserves and Swap Lines: Substitutes or Complements?
3. Arief Ramayandi: The Impact of Financial Shocks on Small, Open Economies: The Case of 4 ASEAN Countries
4. Cyn-Young Park: Managing Capital flows in Asia: Issues and Policy Challenges for Emerging Asia
5. Maria Socorro Gochoco-Bautista, Juthatip Jongwanich, and Jong Wha Lee: How Effective are Capital Controls in Asia?

Discussants:
1. Shahid Ahmed
2. John Junggun Oh
3. Eiji Ogawa
4. Hyoungsik Noh
5. Kian-Teng Kwek

CS1-C Poverty and Income Distribution
Chair: Fernando Aldaba
1. Tamgid Ahmed Chowdhury and Pundarik Mukhopadhaya: Efficiency of Service Providers in Poverty Alleviation Programs in Bangladesh and their Gender bias

3. Joseph J. Capuno and Marian Panganiban: From Devolution to Consolidation: Local Health Systems Arrangements and Maternal and Child Health Indicators an the Philippine
4. Keisuke Okada: HIV/AIDS, fertility and child health in Cambodia

Discussants:
1. Marian Panganiban
2. Keisuke Okada
3. Yun Jeong Choi
4. Saki Sugano

CS3-D Labor Economics

Chair: Manabu Fujimura
1. Xiling WU: The Quantitative Analysis of the Changes in the Labour Market in Sichuan after the Earthquake
2. Kampon Adireksombat, Zheng Fang, and Chris Sakellariou: The Evolution of Gender Wage Differentials and Discrimination in Thailand, 1991-2007 —An Application of Unconditional Quantile Regression
3. Fengliang LI, ZHAO Yandong, and J. W. MORGAN: Job Search Intensity, Cost and Outcome: Evidences from the Job Market for Post-graduate Students in China
4. Tae Hoon KIM: Signaling Effect of Layoffs in Korea: An Empirical Analysis

Discussants:
1. Fengliang LI
2. Sungho RHO
3. Masakazu Hojo
4. Bienvenido S. Cortes

CS3-E International Investment and Capital Flows

Chair: Eiji Ogawa
1. Shu-Fei Yang and Kun-Ming Chen: The Impact of Outward Foreign Direct Investment on Domestic R&D Activity: Cost-saving versus Technology-sourcing
2. Radziah Adam, Noor Aini Khalifah, and Salmah Mohamad Salleh: Horizontal and Vertical (Buyer-Supplier) Spillovers from Foreign Direct Investment: Determinants of Malaysian Establishments" Total Factor Productivity
3. Phanhpakit Onphanhdala and Terukazu SURUGA: Assessing the Impact of FDI and the Investment Climate in Lao PDR

Discussants:
1. Mitsuyo Ando
2. Shu-Fei Yang
3. Nadia Doytch

CS3-F NIDA and University of Antwerp Session on Economic Integration

Chair: Ludo Cuyvers
1. Ludo Cuyvers, Reth Soeng, Joseph Plasmans, Daniel Van Den Bulcke: Productivity Spillovers from Foreign Direct Investment in the Cambodian Manufacturing Sector: Evidence from Establishment-Level Data
2. Ludo Cuyvers and Reth Soeng: The Impact of the EU Generalized System of Preferences on Exports and GSP Utilization by Asian and Latin American Countries
3. Sasatra Sudsawasd: Regional Trade Integration in East Asia: Gravity Model Applications
4. Santi Chaisrisawatsuk: After ASEAN FTA, How Integrated We Are

Discussants:
1. Tze-Haw CHAN
2. Donghyun PARK
3. Toshiyuki MATSUURA
4. Chee-Wooi HOOY

CS3-G Exchange Rates

Chair: Kiyotaka Sato
1. Sovannroeun Samreth: Empirical Studey on the Hysteresis of Currency Substitution in Cambodia
2. Craig Parsons: Marston (1990) redux in Japanese autos at the retail level: How much Pricing-to-Market is really going on?